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# SCIENCE

FRIDAY, MAY 14, 1909

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MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

## SOME TRENDS IN HIGHER EDUCATION<sup>1</sup>

THE student of the higher educational system can not help becoming impressed by certain very pronounced phenomena. These grow most obvious if the graphical method is used for the expression of tabulated data, and that method has therefore been relied upon here to visualize the movements under discussion.

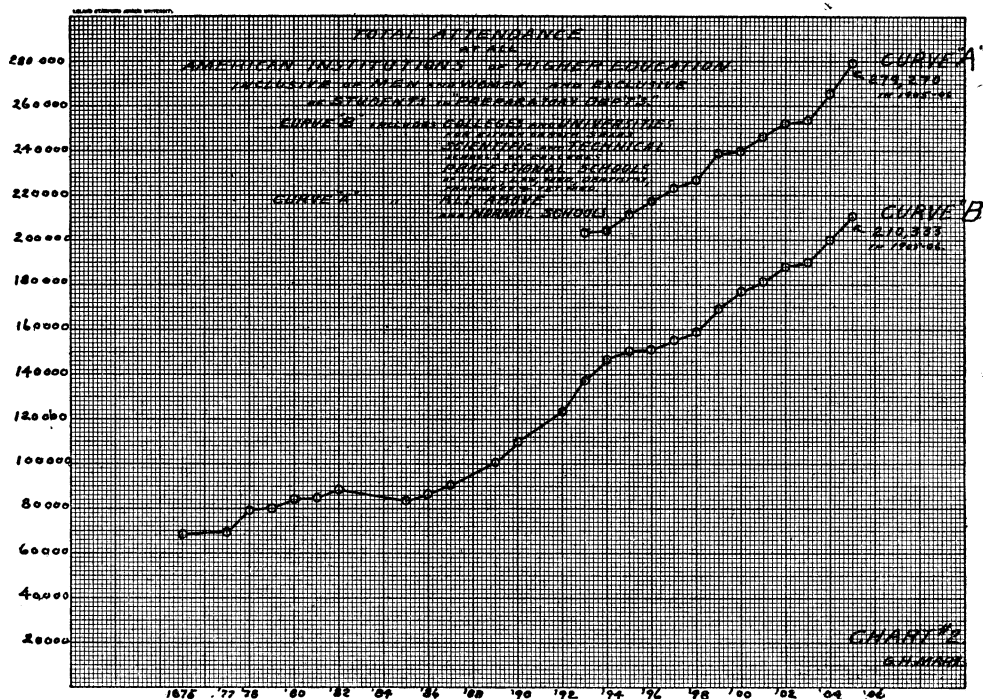
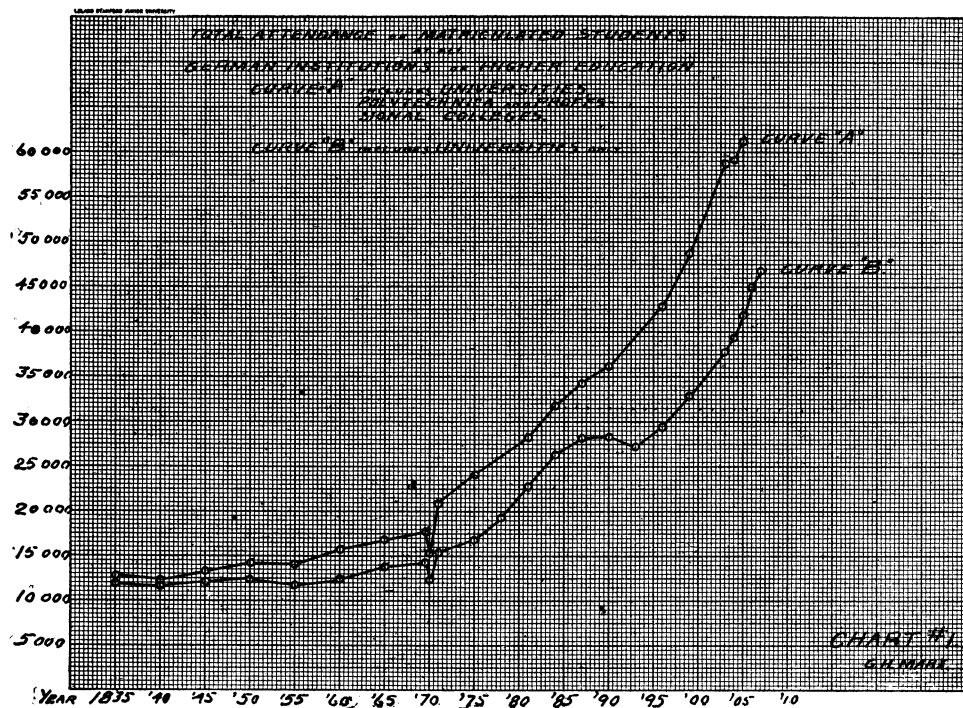
First among the phenomena, and bearing all the others in its train, is the remarkable growth and spread of interest in higher education, and the consequent tremendous increase in the number of those pursuing advanced studies and receiving higher training.

Chart No. 1 deals with the conditions in Germany as disclosed by a study of educational statistics compiled from official sources.<sup>2</sup> It is natural for us to look to Germany for significant educational movements and well-kept statistics. An examination of Curve B of the combined

<sup>1</sup> The charts which form the basis of this paper are part of those which have been constructed by the writer for his use in studying certain movements bearing upon the problem of educational efficiency. Effort has been made to have the data as complete and accurate as the time at his disposal for this work would permit, although it is too much to hope that no minor errors or discrepancies have been overlooked.

For data furnished, other than those available in official publications, he wishes to make especial acknowledgment to Presidents Schurman, Van Hise, Wheeler and Jordan and their respective secretaries.

<sup>2</sup> Lexis's "Public Education in the German Empire"; Ascherson's "Kalender der deutschen Universitäten" and "Minerva."



attendance at the twenty-two German universities reveals at once the most striking fact developed in the course of this investigation. It will be seen that prior to 1870 (the year of the Franco-Prussian war) this attendance was fairly uniform (the yeast of the spirit of 1848-9 can, however, be seen to have been slightly working), keeping regular pace with the population and thereby betokening a certain stable condition of the social order. Immediately after this date we find the curve taking a sharp upward bend and an increase in attendance growing much more rapidly than the population. Nor does this increase show the slightest tendency to fall off. It is even more marked if we plot the combined attendance at all the German universities, polytechnic and professional colleges above gymnasial rank as in Curve A.<sup>7</sup>

At the beginning of the period of rapid development (1870) we find one student for every two thousand inhabitants, while in 1907 we find one student for every thousand inhabitants. This denotes twice as wide-spread a participation in the benefits of higher education—and, involving, as this must, higher personal efficiency, needs and aspirations, it is not too much to claim that we are well on the way toward an entirely new social order; that we are in the midst of an intellectual renaissance of profoundest import, of a movement which is one of the most significant in the history of the development and progress of the race.

Were Germany alone in this movement so broad a statement would be unjustifiable—but she does not stand alone, she is simply preceding the other nations.

Chart No. 2 deals with the statistics for the United States and is based upon data

<sup>7</sup>The disturbed political conditions of 1887-8 show in the form of an offset in both curves; more marked in B.

compiled from annual Reports of the Commissioner of Education. Curve B gives the combined attendance at all the colleges, universities, scientific, technical and professional schools, omitting preparatory departments. Up to the year 1885 we see a condition of practical stability, but beginning with that year the curve takes an upward bend and continues with no sign of falling off. We see repeated the same story told by the German curves but beginning fifteen years later. In 1885 we find one student for every seven hundred inhabitants, twenty years later, in 1905, one for every four hundred—or, if we include the Normal School attendance as given by Curve A, one for every three hundred inhabitants.

Even though the United States shows the same phenomenon, our broad statement might have to be qualified. But the following table (I.) shows that the movement is not confined to these two countries. Here we see that Russia is the only western country of prominence which has not passed Germany's figure of the year 1870, namely, one student for two thousand inhabitants. Perhaps the most striking fact displayed by this table is the way Great Britain has lagged in this vast movement of the democratization of the advantages of higher education—and, scarcely less significant, the strong leading position of the United States.

To analyze the forces underlying this great wave of emancipation, fascinating as the study may be, is a task lying beyond our present powers. It remains a problem for the future historian. We must content ourselves with noting the phenomenon and passing on to some of its effects. It is also to be noted in passing that going side by side with the great increase in numbers there has been a vast improvement in the standards of the edu-



TABLE I

Country	Population <sup>a</sup>	Number of Students in Higher Educational Institutions	Population per Student
United States	84,000,000	210,333 <sup>4</sup> 279,270 (Inc. Normal Sch.)	400 [300]
Switzerland	3,500,000	6,500 <sup>5</sup>	530
Germany	61,000,000	61,267 Matriculates <sup>6</sup> 75,639 Incl. hearers	1,000 [800]
Sweden	5,300,000	5,000 <sup>5</sup>	1,060
France	39,000,000	32,000 <sup>5</sup>	1,200
Roumania	6,000,000	5,000 <sup>5</sup>	1,200
Italy	33,000,000	24,000 <sup>5</sup>	1,400
Belgium	7,100,000	5,000 <sup>5</sup>	1,400
Holland	5,600,000	4,000 <sup>5</sup>	1,400
Austria-Hungary	47,000,000	30,000 <sup>5</sup>	1,570
Spain	19,000,000	12,000 <sup>5</sup>	1,600
Great Britain	44,000,000	25,000 <sup>5</sup>	1,750
Russia	147,000,000	23,000	6,400

educational institutions as affecting both their entrance requirements and their own grade of work. Whether as cause or effect there has also accompanied this wonderful

growth a remarkable broadening of curriculum and quite a complete change of emphasis on what constitute the essential factors of higher training.

TABLE II

*Ratios of Attendance of Various Courses at the German Universities, Technical and Professional Colleges*

Faculty				Ratio	
	1830	1869	1905	1869 1830	1905 1869
<i>Universities</i>					
Theology	6,076	2,986	3,846	0.49	1.29
Law and Finance	4,502	3,178	12,456	0.71	3.92
Medicine (Including Dentistry)	2,355	3,140	6,142	1.33	1.96
Philosophy (Incl. Philology, Mathematics and Science)	2,937	4,853	19,494	1.65	4.03
<i>Polytechnica</i>					
Architecture and Civil Engineering <sup>a</sup>		942 <sup>a</sup>	5,443		5.75
Mech. and Elec. Engineering <sup>a</sup>		241 <sup>a</sup>	5,161		21.50
Chemical Technology		213 <sup>a</sup>	1,431		6.70
Special Branches		418 <sup>a</sup>	1,577		3.77
<i>Professional Colleges</i>					
Mining		144	686 [835 Incl. hearers]		4.77
Forestry		306	309 [366 " " ]		1.01
Agriculture		357	1,517 [1,698 " " ]		4.25
Veterinary Medicine		267	1,120 [1,260 " " ]		4.20
Commercial Universities			1,076 [3,098 " " ]		

Unless otherwise stated, the numbers are for matriculated students only. The ratios are for matriculates.

Population: 1869: 40,805,000; 1905, 60,314,000. Ratio: 1905/1869, 1.5.

<sup>a</sup> Population from "World's Almanac—1908."

<sup>4</sup> Includes both sexes in colleges, universities, technical and professional schools, exclusive of preparatory departments, 1905–6.

<sup>5</sup> Original data not segregated.

<sup>6</sup> Universities only. Figures taken from SCIENCE, September 25, 1908, for 1907.

<sup>a</sup> Includes universities, technical and professional schools above gymnasial rank, 1905–6.

It is of interest to compare this vast and increasing throng of students to a powerful stream which, refusing longer to be confined within narrow, artificial banks, has burst through and found its own natural channels. What these have been can be seen from the foregoing table (II.), comparing the German student attendance in the various channels of work for the years 1869 and 1905.

The following table (III.), comparing American and German attendance, also throws light upon this phase of our subject.

is more nearly commensurate. Another item not indicated here is the much larger proportion of women students in the United States. However, this broad subject of comparison can only be touched upon and left with the statement that American standards are rapidly improving, more rapidly than they are aware who have not been giving attention to the subject.

In the light of these charts and figures is it too much to claim that they betoken a rapid breaking down of old forms of caste, class and privilege—a great social

TABLE III  
*Comparison of Attendance of Various Courses in Germany and the United States 1905-6*

	United States	Germany	Ratio U. S. G.
Population	83,935,000	60,314,000	1.39
Theology	7,968	3,846	2.07
Law	15,411	12,456	1.22
Medicine	24,924	6,142	4.05
(Incl. Dent. and Pharmacy)	36,945		[6.01]
Philosophy or		19,494	
Liberal Arts	94,200 <sup>10</sup>		4.83
Arch. and Civ. Engineering <sup>9</sup>	10,200 <sup>10</sup>	5,443 <sup>11</sup>	1.86
Mech. and El. Engineering <sup>9</sup>	15,150 <sup>10</sup>	5,161	2.95
Chemical Technology	1,420 <sup>10</sup>	1,431	1.00
Mining	3,260 <sup>10</sup>	686	4.75
Agriculture	5,000 <sup>10</sup>	1,517	3.3
Veterinary Medicine	1,445	1,120	1.29

Data from Ascherson, Lexis, Minerva and Report of U. S. Commissioner of Education, 1906.

In making this comparison too definite conclusions must not be drawn, as the writer is well aware of the differences in standards and curricula. Thus it is probable that quite one half of our collegiate students are doing work of German gymnasial grade. In the technical and professional fields it is possible that the work

upheaval signaling the imminence of a new social order? Can no connection be traced between this increasing stream of trained young men and women taking up their duties of citizenship, and the great wave of awakening to a higher sense of social obligation and civic righteousness now rising in our country?

<sup>9</sup> Not segregated in German data. In United States, 900 Arch., 9,300 C. E. and 2,700 Gen'l Eng.

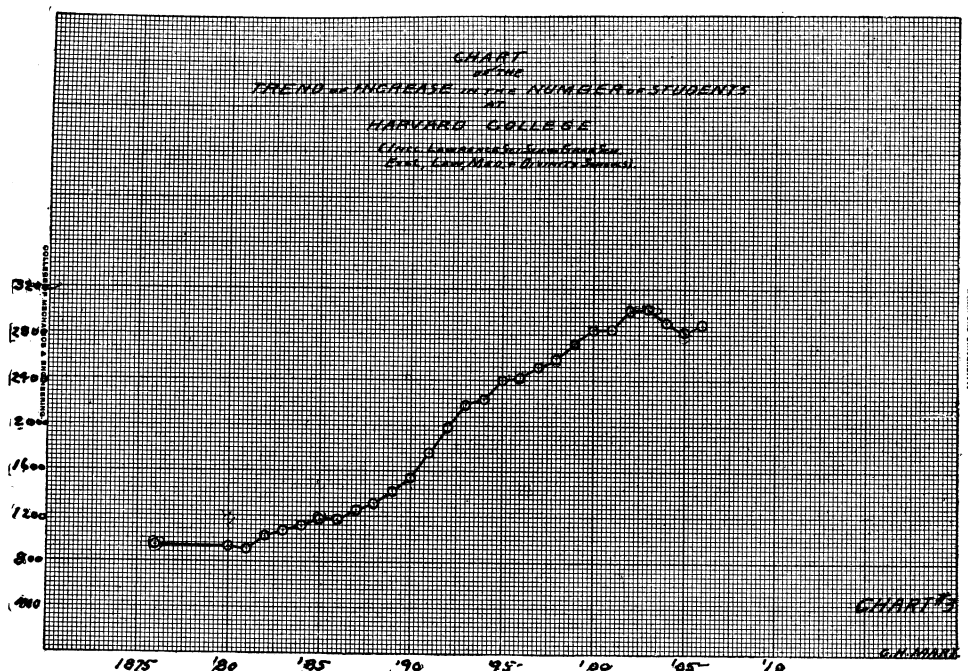
<sup>10</sup> Computed on basis of returns for 86.5 per cent. of total. See Report U. S. Commissioner of Education, 1906, p. 446.

<sup>11</sup> In 1902 there were 1,995 Arch. and 2,852 C. E. On a proportionate division this gives in 1905-6, 2,220 Arch. and 3,223 C. E.

It is folly to dream of checking this mighty stream or of turning it back into the banks of a narrow scholasticism. Our problem is to provide adequate and suitable channels for it. Conditions are rapidly changing and we, as educators, must face the facts as they are.

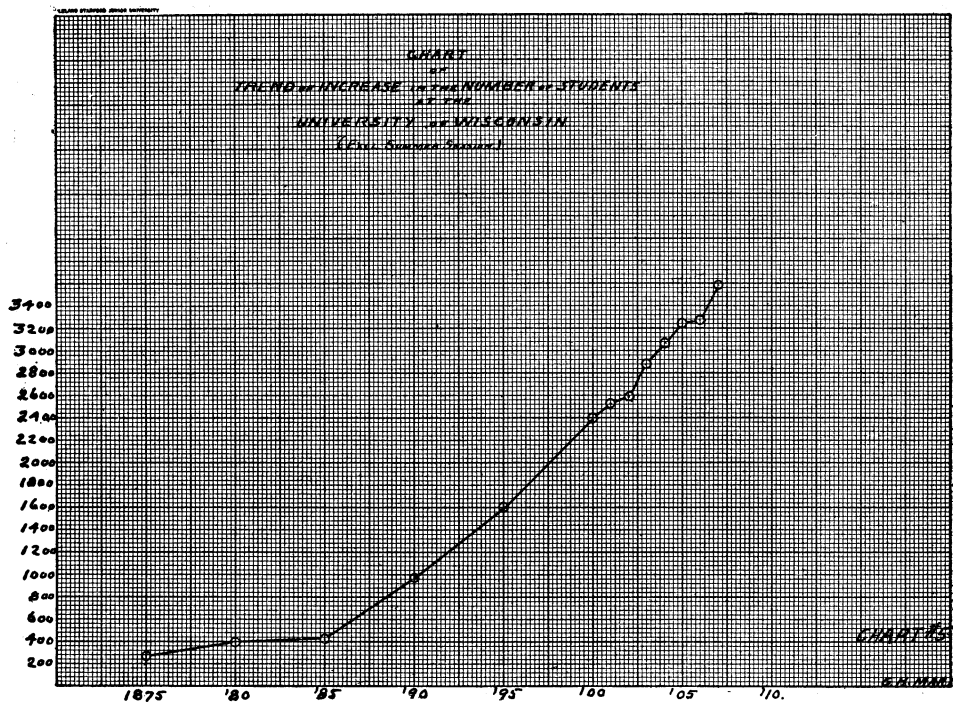
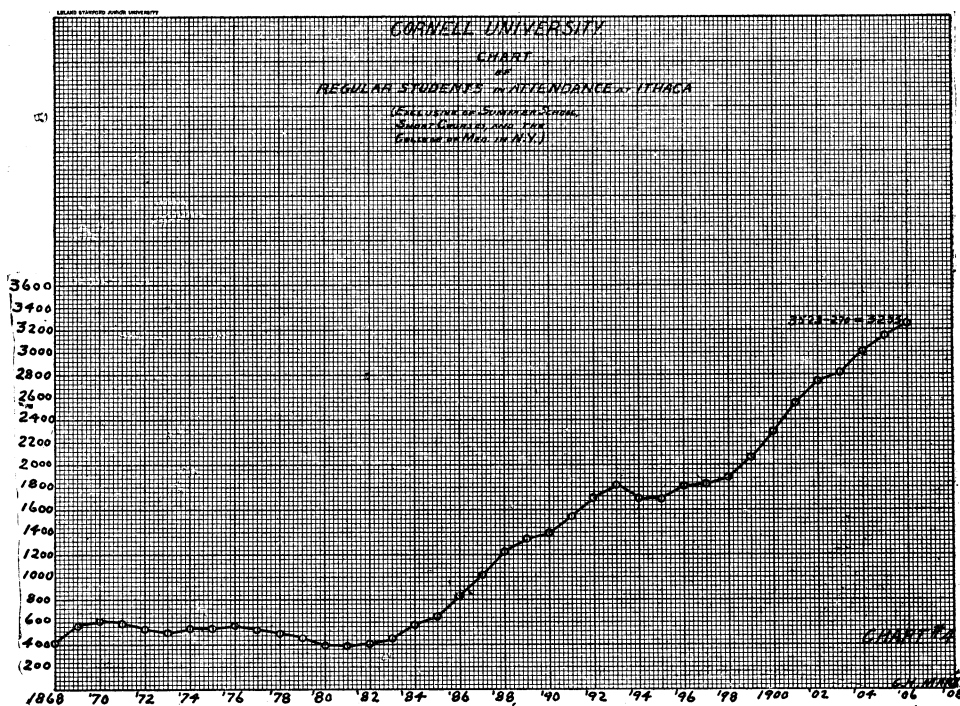
The profound demand of this army of nearly three hundred thousand students in our country to-day is for an education which will enable them to live most worthily and effectively the life of to-day and to-morrow. The demand, which will not be denied, is for breadth of culture coupled with an effective bearing upon the needs and problems of life—a culture whose key-note shall be efficiency in action and service.

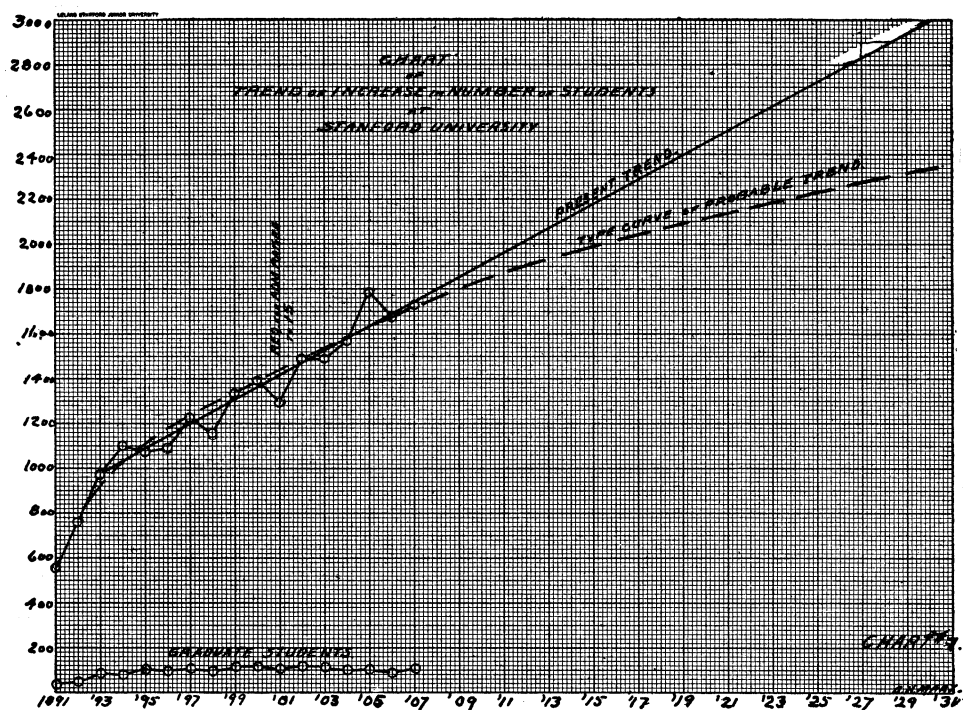
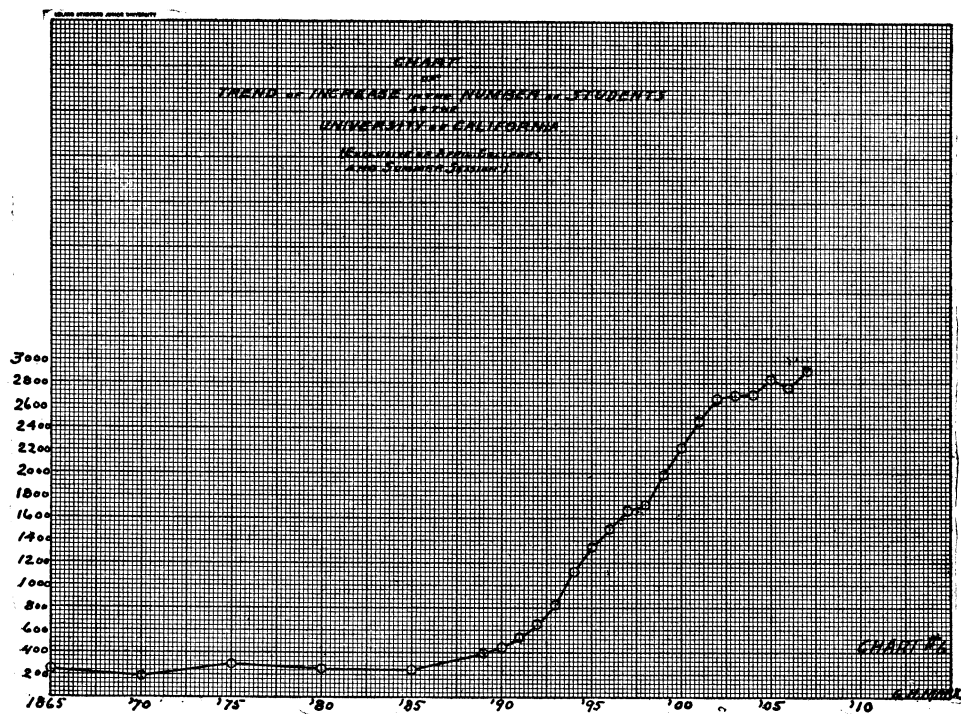
Charts 3-7 show the trend of growth of student body. It is interesting to remark that each one of these institutions which was established before 1885 shows the same general trend of increase, as is shown by Curve B of Chart 2, the curve of combined attendance at all higher American institutions of learning. Slight irregularities, due to local conditions, such as change of entrance requirements, etc., are, to be sure, to be observed. In common



Passing from the general aspect of our problem to certain effects brought in its train, it is significant to note the results wrought upon the individual institutions. For the purposes of this investigation five typical American universities have been selected. Geographically they form a chain across our country and in type they represent institutions resting upon private foundations, public foundations and combined public and private foundations. They are Harvard, Cornell, Wisconsin, California and Stanford.

with Curve B they show the effect of the hard times following 1873 and 1893 in the form of a decided offset or sag. A similar effect may be expected in the years following 1907. It will be noted that the effect is a delayed rather than immediate one. Each chart shows a practically uniform attendance until about 1885 and then a sharp upward bend maintained with essential uniformity. Is it not strange that institutions differing widely in their nature and separated by thousands of miles geographically should experience simul-

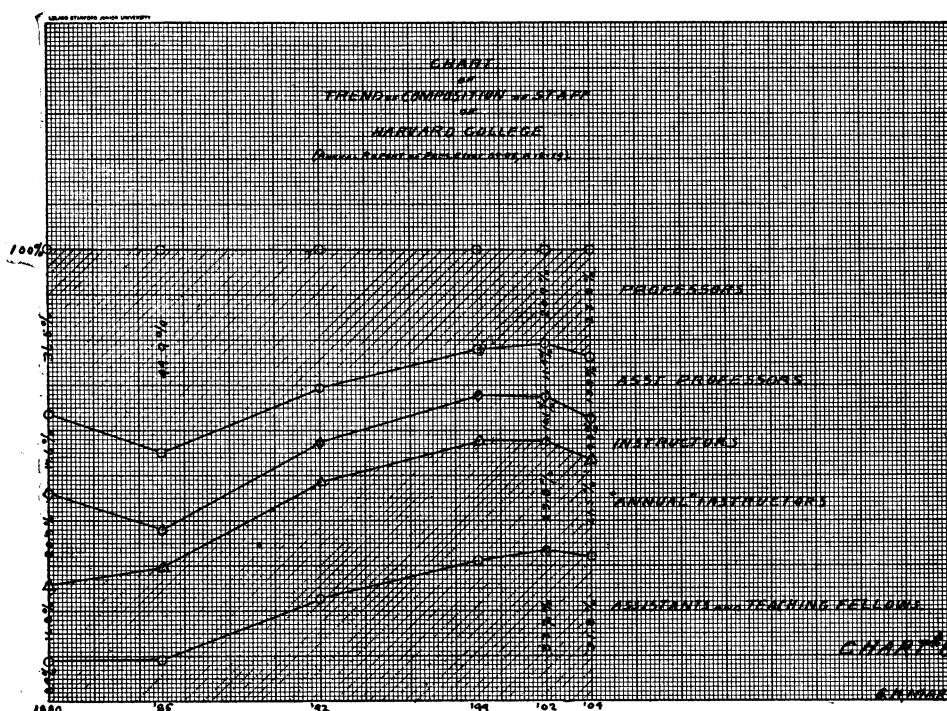




taneously this thrill of rebirth? Who shall maintain that the growth of any single institution, beginning at this time, was due to the direct action or influence of some particular individual or administration? No, this simultaneous action indicates a much more profound cause than this—an institution not to have been affected by this broad, fundamental movement must have definitely turned its back upon the demand of the times and refused to open its gates to an awakening people.

effect on the efficiency of the institution; and second, with respect to the possibilities of university teaching as a profession. In other words, first with respect to the *institution*, and, second, with respect to the *staff*.

1. It will be seen that the proportion of full professors in each staff has been a continuously and rapidly *decreasing* one, that the proportion of associate and assistant professors has remained about constant and that the proportion of instruct-

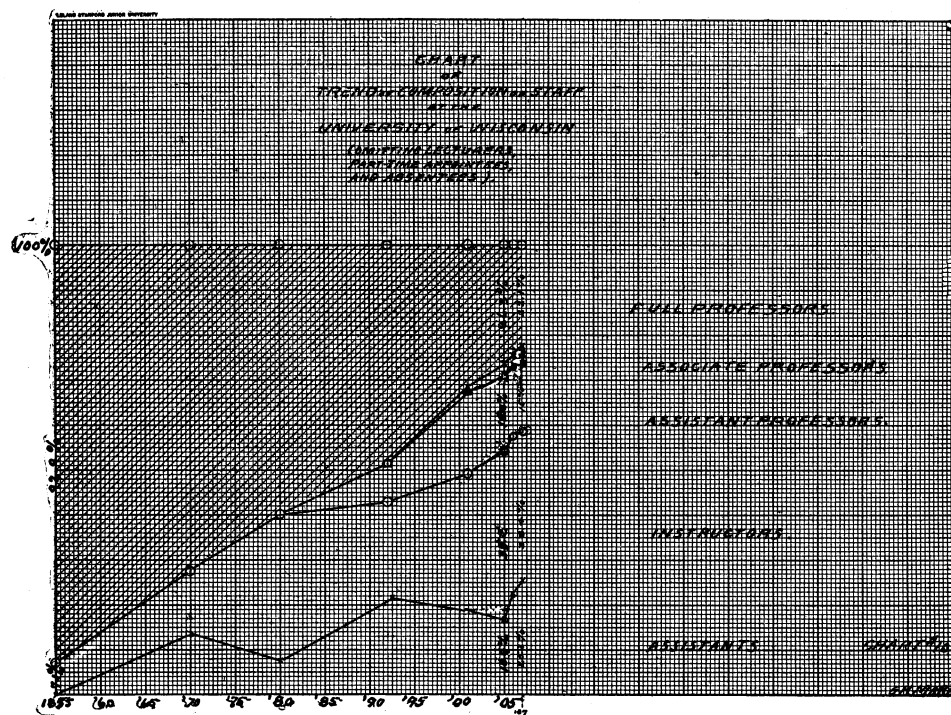
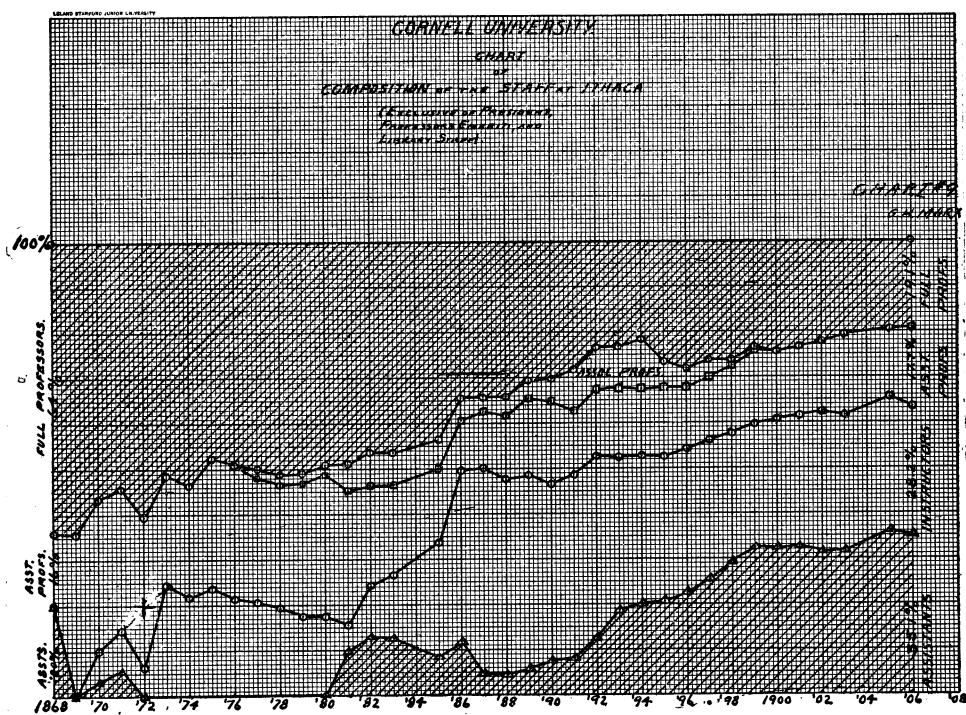


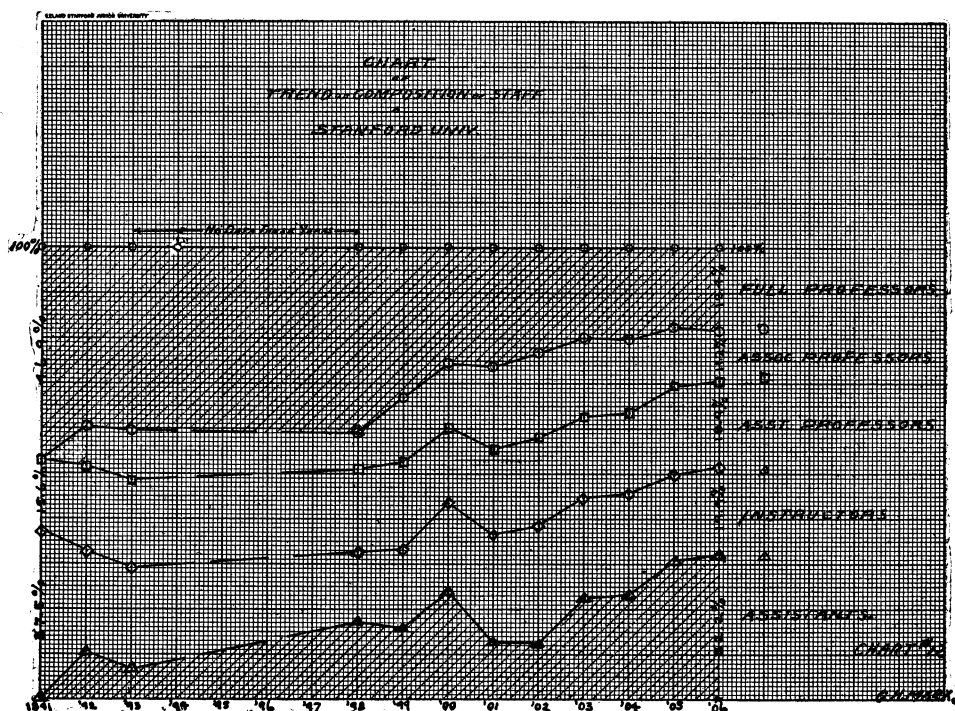
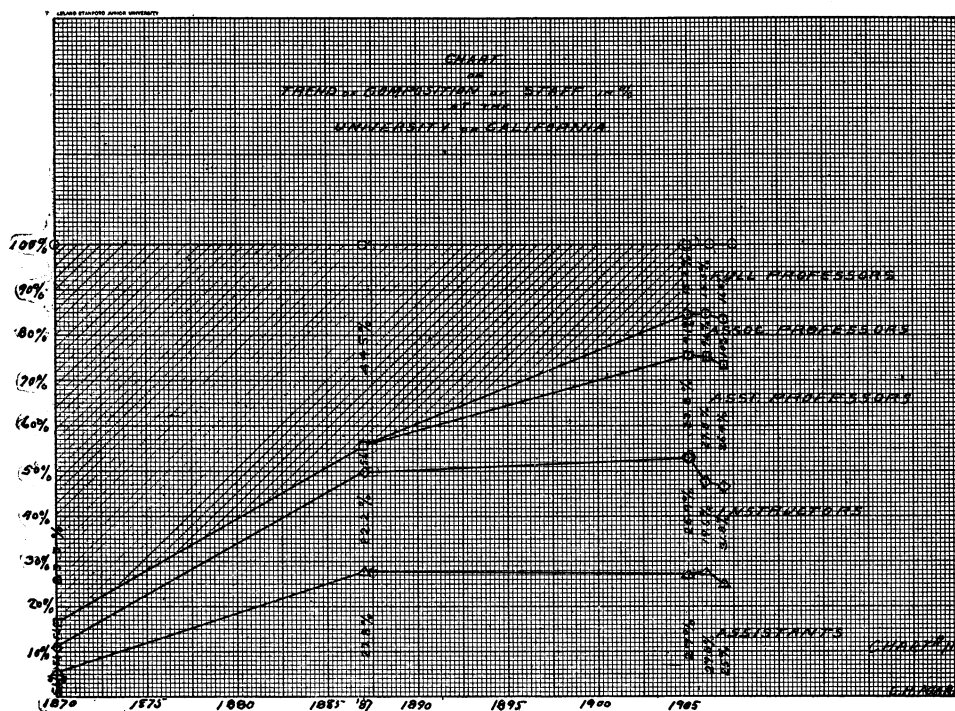
Aside from its effect upon the curricula of the institutions, a subject worthy of careful study, this rapid growth has wrought profound changes upon the nature and composition of the teaching staffs.

Charts 8 to 12 show the composition of the staffs year by year. These charts, like those of attendance, all show identically the same trends. They should be studied with reference to two items: First, the

ors and assistants is most alarmingly *increasing*. The cause of these trends at all of our universities is a triple one; the rapid increase in the number of students for whom instruction is to be provided, the failure of the incomes of the institutions to keep proportionate step and a deplorable rivalry in bigness and externalism leading to unwise and unnecessary expenditures for buildings and equipment. It certainly means one thing as regards









efficiency—a greater and greater share of the instruction falls upon the shoulders of the body of less experienced men and the student has a decreasing chance of working with men who have attained eminence in his line. Each recent alumnus can test the truth of this by asking himself how large a share of his work brought him into actual close and beneficial contact with the full professors in his course. Believing that the influence of personality is one of the most vital elements in training, we can but deplore the trends which separate more and more widely the student from intimate contact with men who have won recognition for success in his field of study.

Another item vitally affecting the efficiency of instruction is that this large number of instructors and assistants (from fifty per cent. to sixty-five per cent. of the staff) consists of men on temporary appointments, so that it is no unusual thing for one half of them to be entirely new appointees at the beginning of each year. The cause for this we will take up later. At present we will content ourselves by asking what can be the sole effect on the efficiency of a staff which annually loses a large proportion of somewhat trained and experienced men, whose places must be filled by beginners who must familiarize themselves with their new duties and be trained up to adequacy?

2. As regards the effect of these trends on the opportunities offered by university teaching as a profession, it need only be said that a man in the lower grades has just one third the chance of winning a place in a twenty per cent. group that he had of winning one in a sixty per cent. group. A study of the increasing average age in the ranks of associate and assistant professors at our universities bears this out.

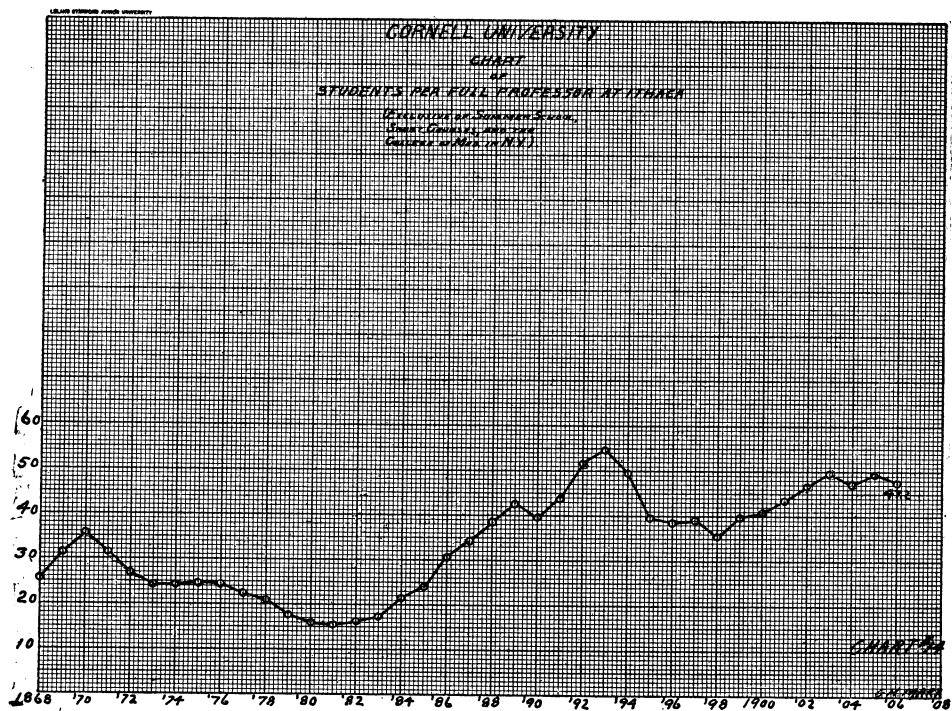
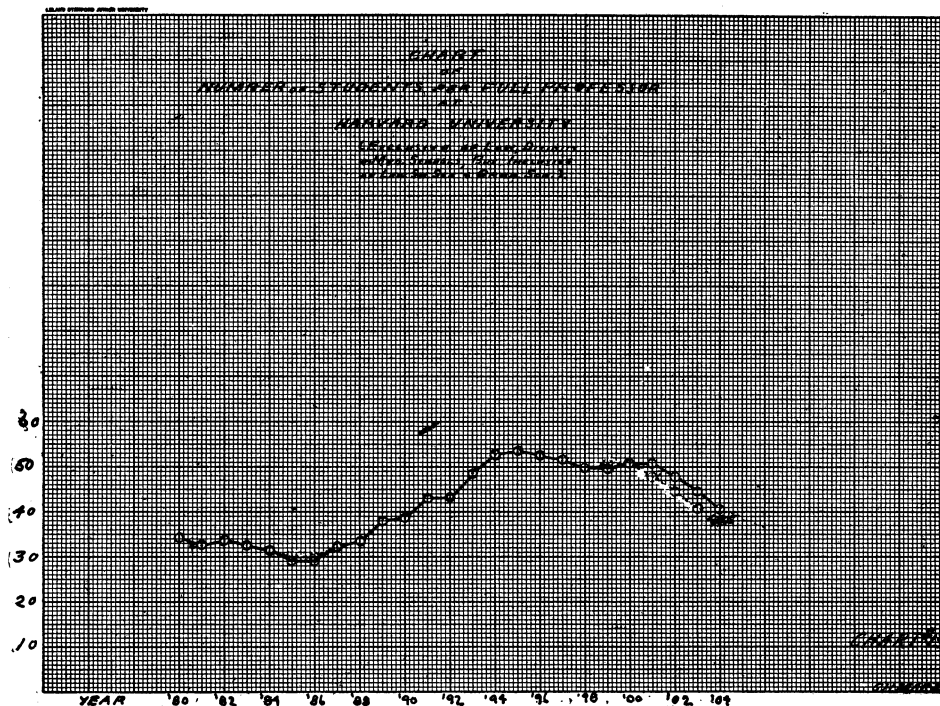
Can it be expected that young men of

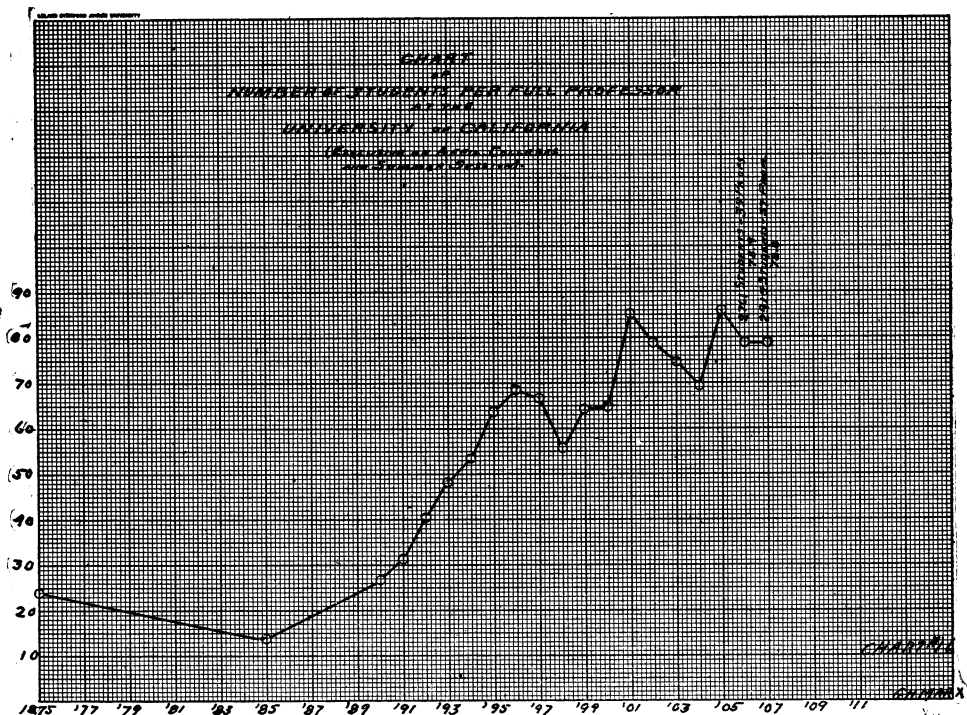
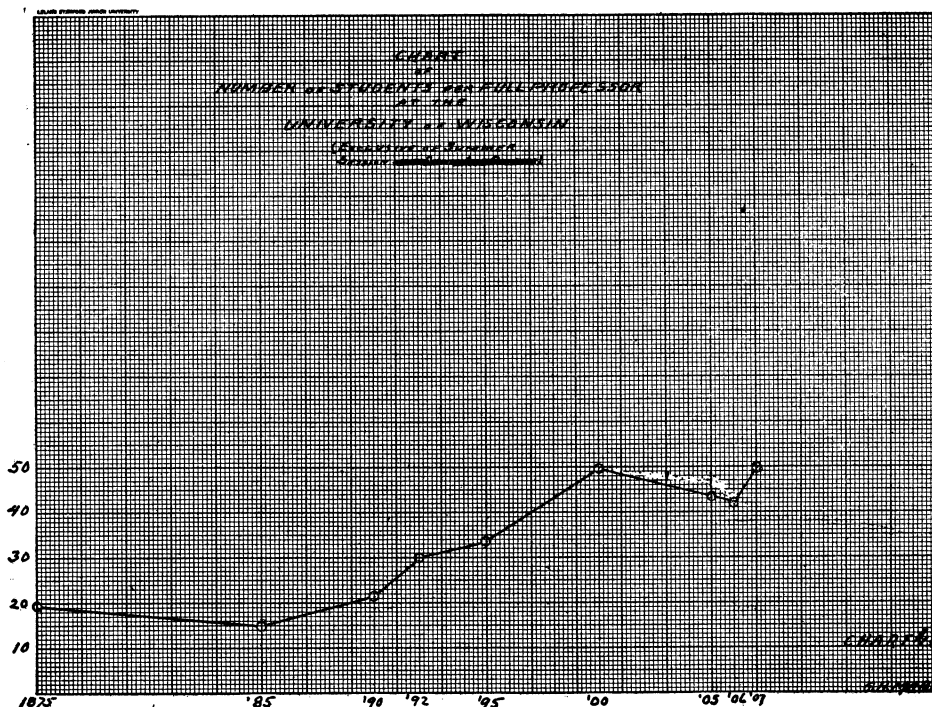
spirit will enter a profession which offers such decreasing chances of winning promotion, however well deserved, coupled with inadequate salary from the very start? What will be the effect on the teaching profession of a continuation of the trends shown by Charts 8 to 12? Interesting and valuable as is the recent Bulletin No. 2 of the Carnegie Foundation dealing with the "Financial Status of the Professor in America and Germany," it is of limited significance in making clear the actual conditions—for the full professors form but a small and rapidly diminishing proportion of our entire teaching staffs—a fact which seems to have escaped recognition.

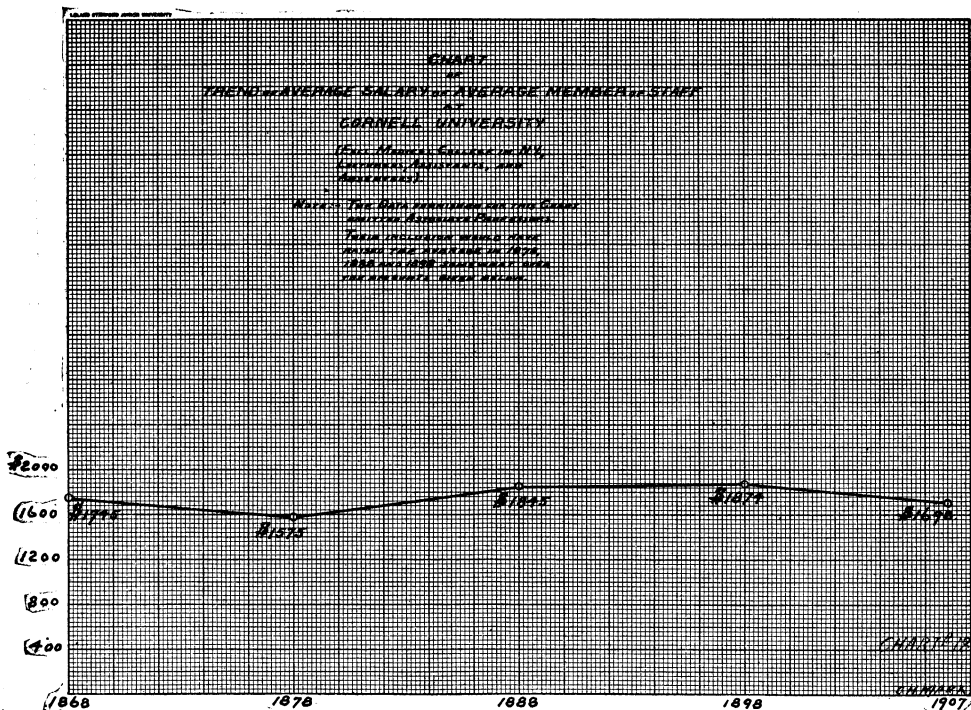
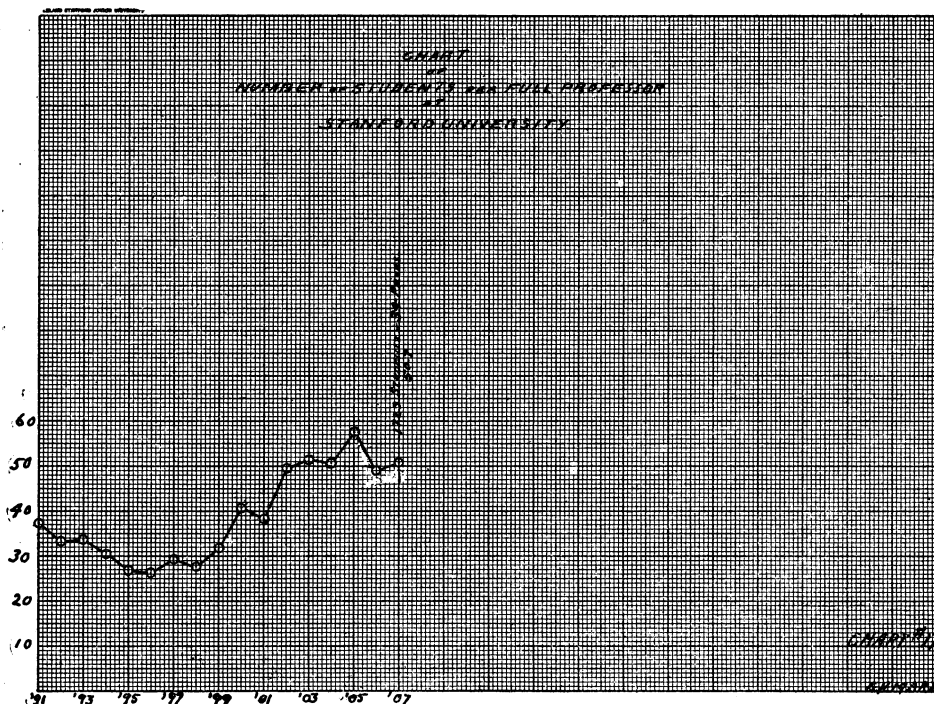
Charts 13–17 show, that while in 1885 (at the beginning of the great upward wave of attendance) there was one full professor to from fifteen to thirty students, we now find forty to eighty students per full professor. In view of these charts of composition of staff, the writer maintains that it is the instructorship and not the professorship which is the key to the situation as regards efficiency. We will return to this point after taking up the next phase of our topic.

Next, approaching a vital aspect of efficient staff and service, we touch the question of trend of salaries.

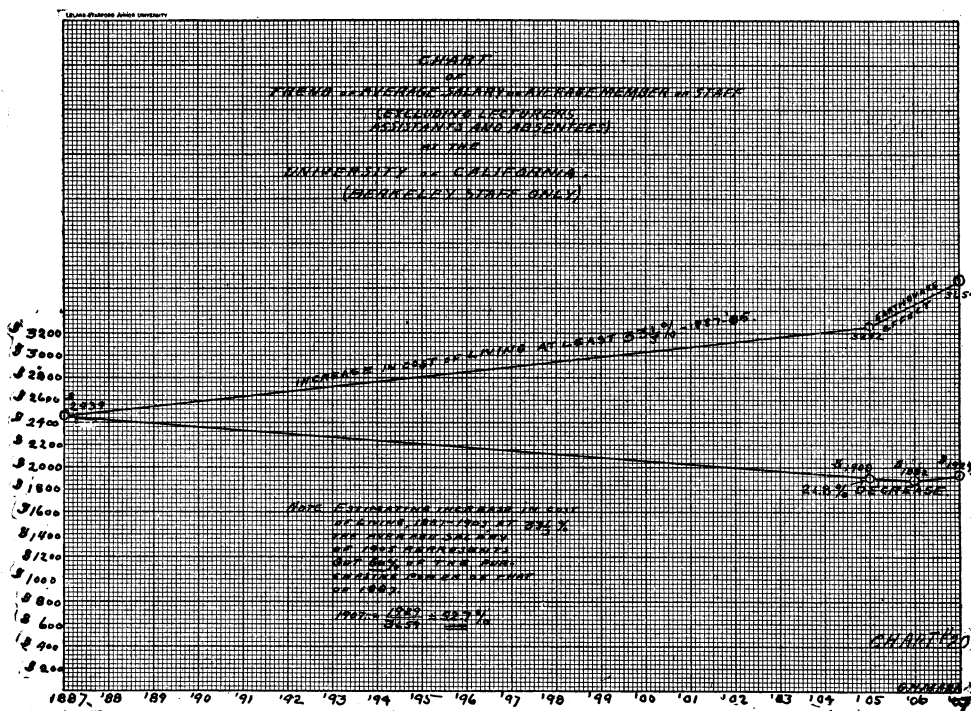
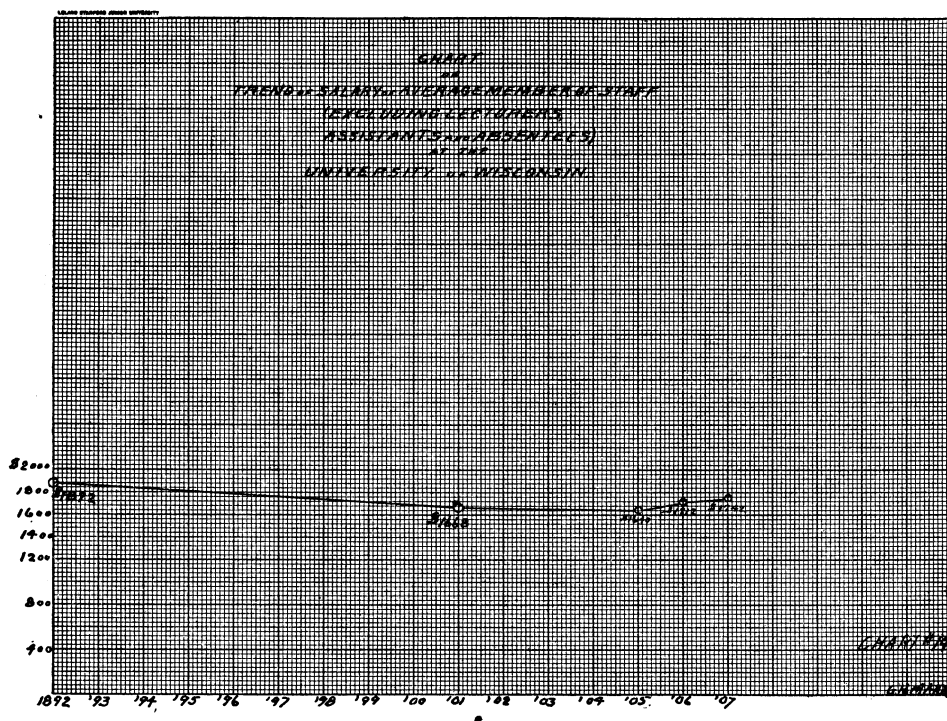
It is to be feared that the world at large fails to appreciate our fine distinctions of adjunct professors, associate professors, full professors, senior professors, deans, and directors. To the man in the street we are all "professor," weary as we may grow of the title, and he looks to us to live up to our position. If we wish to study the actual compensation to which a man in any field may look forward, it is quite significant to know the average compensation of those who may be considered as journeymen. Leaving out all under the rank of instructor as apprentices, Charts







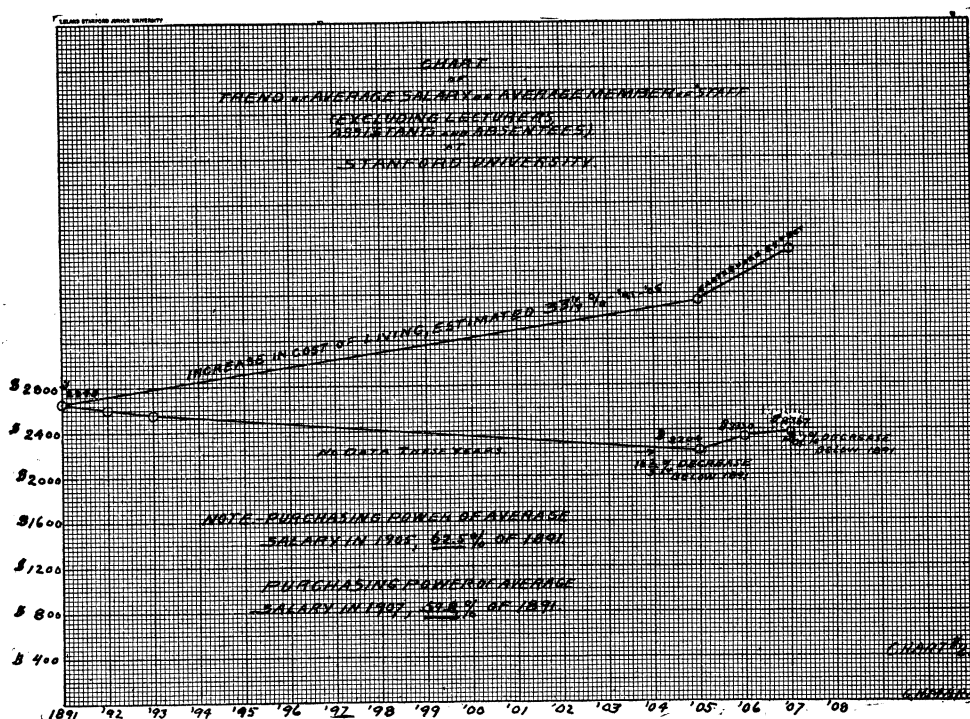




18-21 show the trend of average compensation of the average member of the staff at four of the institutions under consideration. The writer's pleas for the corresponding data for Harvard College were unfortunately unheeded.

The vitally significant thing about these charts is the downward trend of the curves for the past twenty years—a period of great increase in the cost of living. Coupling the increased cost of living, the improvement in the general standard of

paid ministry—in which there has not been an increase in the average rate of compensation somewhat commensurate with the increasing cost of living. Here we see no increase in the average compensation of the profession, but an actual falling off. It may be argued that this is but a natural and legitimate consequence of recruiting so heavily the lower branches of the staff in order to keep up the proportion of teachers to students. This argument falls to the ground, however,



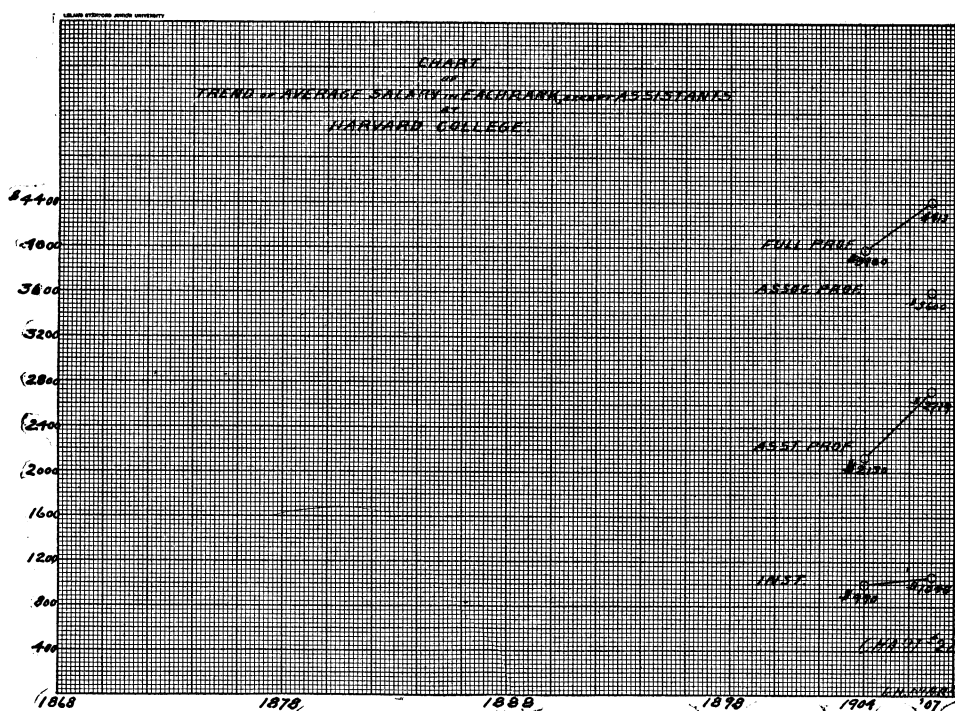
living (a pressure which society exerts upon every man), and the decrease in actual compensation, it is not too much to say that in purchasing power the average teacher of 1908 is but sixty to seventy per cent. as well off as was his colleague of twenty years ago. It is believed that the profession of college teaching is the only field of work in the United States—not even excepting the correspondingly poorly

when we consider the increased requirements of candidates for entrance into the teaching profession over what they were twenty years ago. "The fact is that the university is at the present time able to secure for instructors as well-trained men as those who formerly received appointments as professors in the best American universities"—wrote President Schurman in one of his annual reports some

years ago. "The great and noteworthy expansion of the university, which has been brought about by the labors of the university teachers, has also been brought about at their expense," writes President Butler in one of his annual reports. Strikingly corroborative testimony is borne by a table of age of staff of Harvard College<sup>12</sup> in which it is seen that there was not a single member of the

reasonable pecuniary return for their services.

Charts 22-26 are valuable as segregating the data and showing the movement of salaries in each rank separately. In these, as in the average compensation charts, the downward trend from 1885 to 1905 is noticeable. Beginning with 1905, however, when this matter of salaries came to a sort of focus, there has been



permanent staff under *twenty-eight* years of age.

In spite of the annual influx of new men, it is the writer's belief, based upon study of the matter, that the average age of the *instructors* at the five institutions under consideration is just about *thirty* years. This is an age at which equally trained and gifted men in other business and professional fields of activity have obtained a firm foothold and receive some

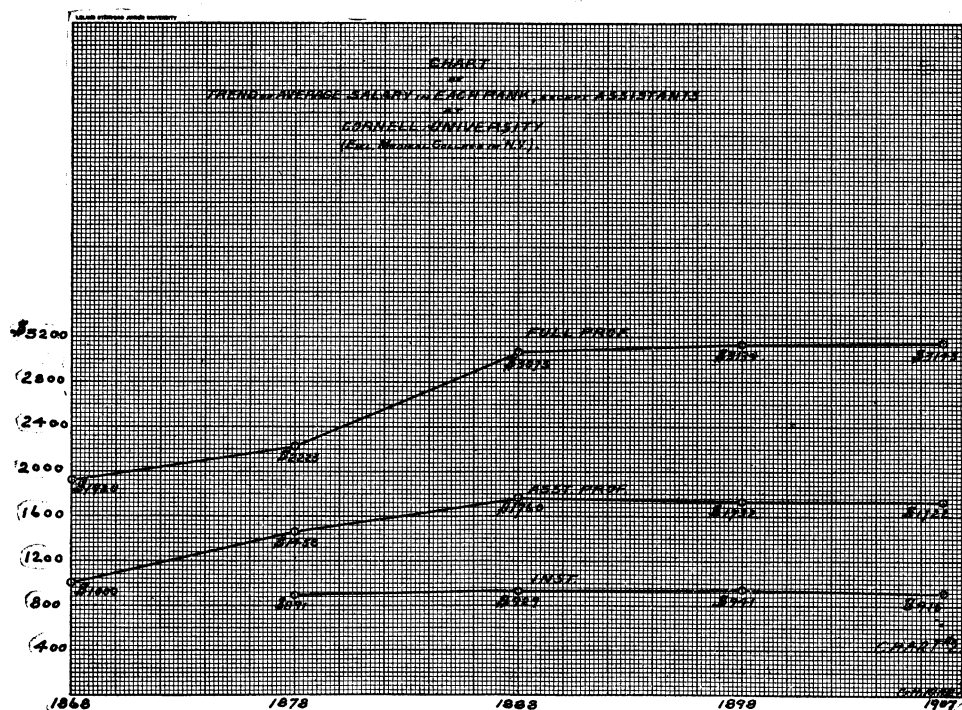
an upward trend of the salary curves at a number of institutions. Incomplete as the Harvard chart is, it is included here to show the effect of the teachers' endowment fund.

The most shocking thing revealed by a study of these charts is the status of the instructor. We have just seen what the age and training of these men is, and the large proportion they form of the entire staff; we now see that their average compensation ranges about a thousand dollars

<sup>12</sup> President Eliot's report, 1904-5, p. 14.

a year in these leading institutions. The most serious danger which threatens the continued and developing efficiency of our universities lies in the unattractive and utterly inadequate salaries paid the instructors. Is it not well to make the portals through which all must enter the collegiate teaching profession reasonably attractive to men of character, spirit and ability? The writer is well aware of the satisfactions and rewards of the teacher's

part of the burden of the instruction falls, and within the limitations of their ranks must develop those who are to recruit the higher positions. Nine hundred or a thousand dollars a year for doctors of philosophy! Why should our universities place so very low an estimate upon the value of their own product? As if to discredit the rank still more, the rules of the Carnegie Foundation refuse to recognize the years spent in it as a teacher toward

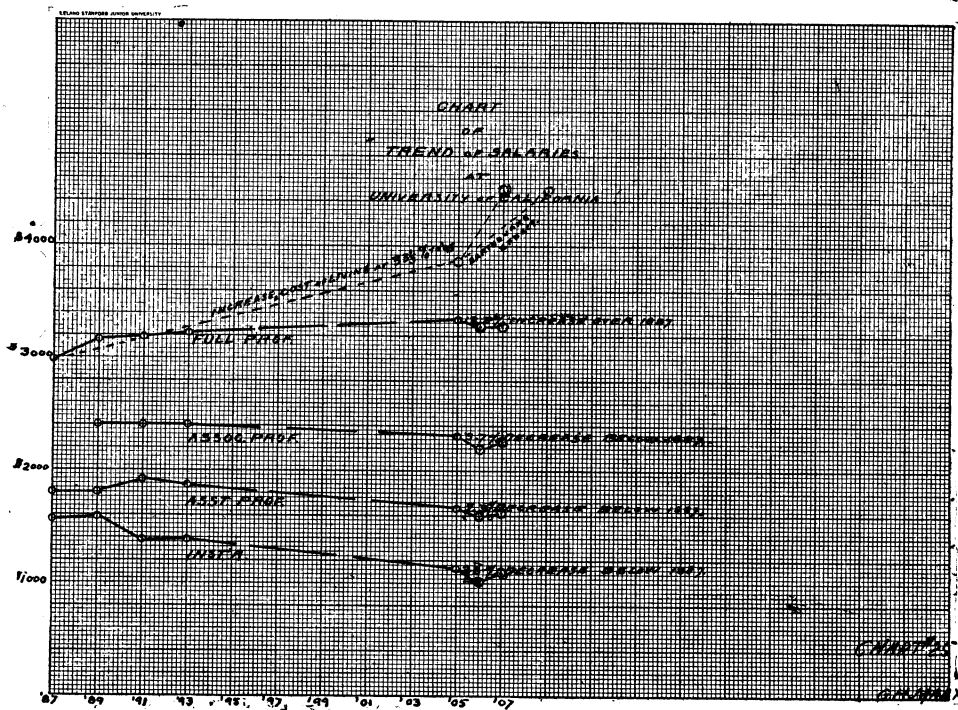
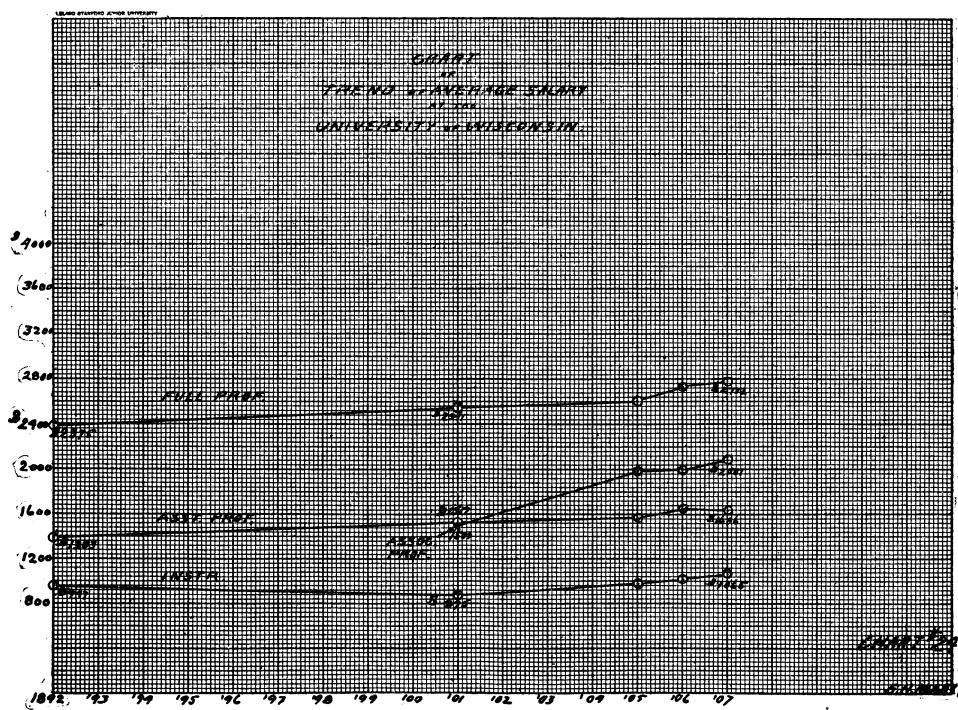


life other than financial, but should not these men for the sake of the efficiency of the institutions receive salaries somewhat commensurate with the long and expensive preparation for their life work, and *adequate to insure the possibility of their intellectual development rather than retrogression?*

Is it to be expected, otherwise, that the field of university teaching will appeal to men of suitable quality? It has been seen that it is upon these men that the greater

the necessary twenty-five years of service entitling one to a retiring allowance. The writer has known of able men, loyal to their institutions, who have spent fifteen years and more in this rank before receiving deserved promotion. Furthermore, most institutions rob themselves of the younger men's natural desire to pursue advanced study and to grow, by loading them down with a heavy burden of entirely elementary work—and refusing to count years of service as instructor toward

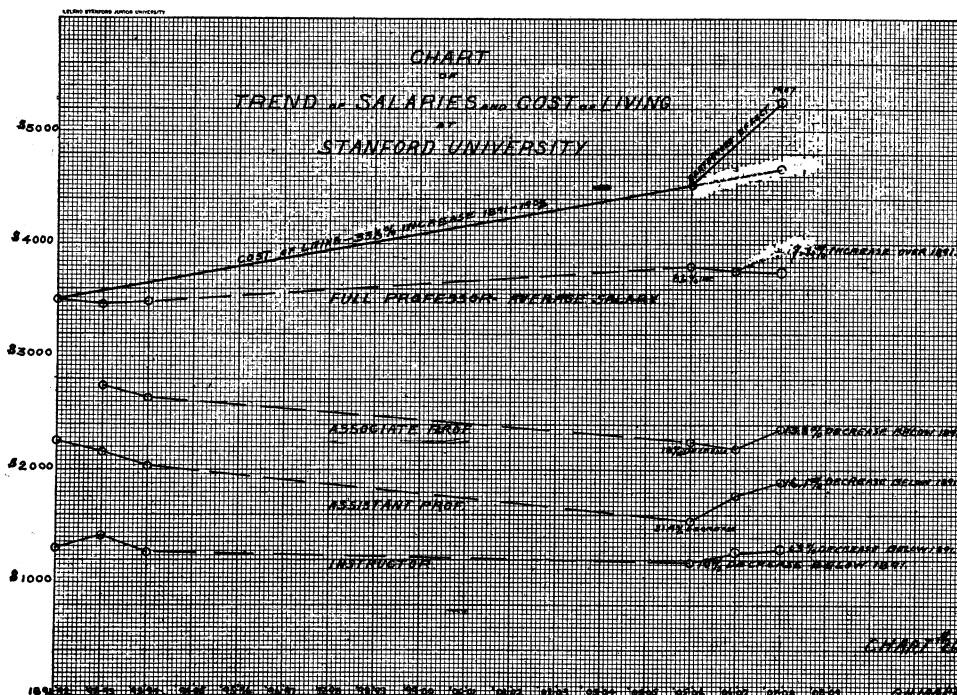




a sabbatical leave. Surely these are short-sighted policies. Let us trust they will soon be abandoned. It is no wonder that after a fair trial of the profession for which they have prepared themselves many of the more spirited men leave it—albeit regretfully—for fields in which they can earn a respectable living, thus creating vacancies to be filled by inexperienced successors. This is the movement, earlier

capital lottery prizes in the professorial rank is far from reaching the root of the trouble. It does not touch the facts really disclosed by a careful diagnosis of the data. In truth, the effect of such a policy will inevitably be to make the actual situation worse for the great mass of teachers. This becomes clear from a study of charts 27–31.

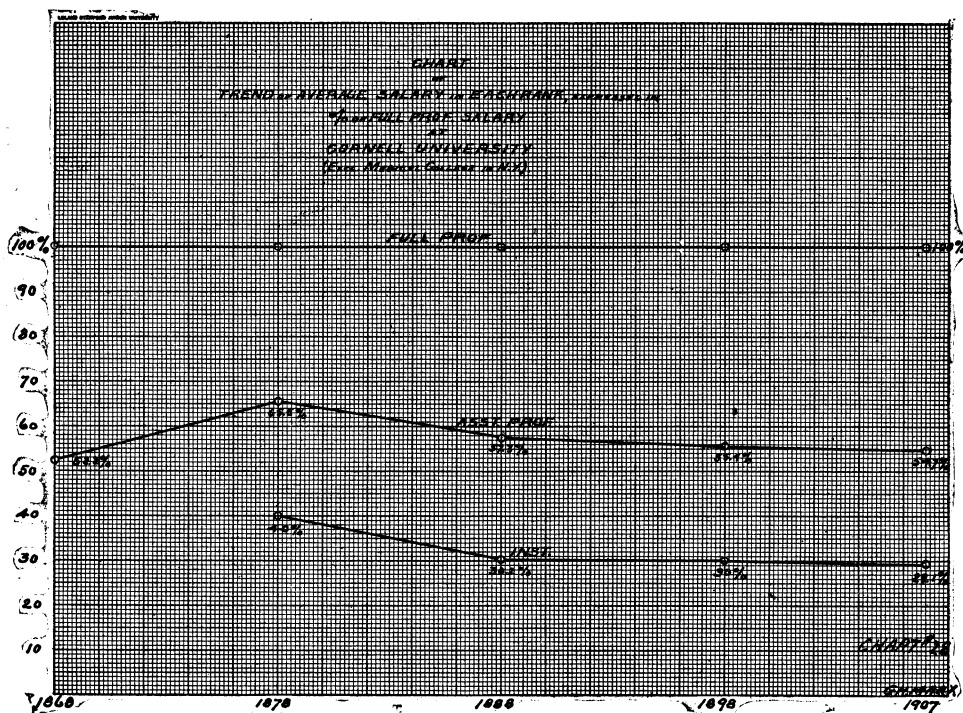
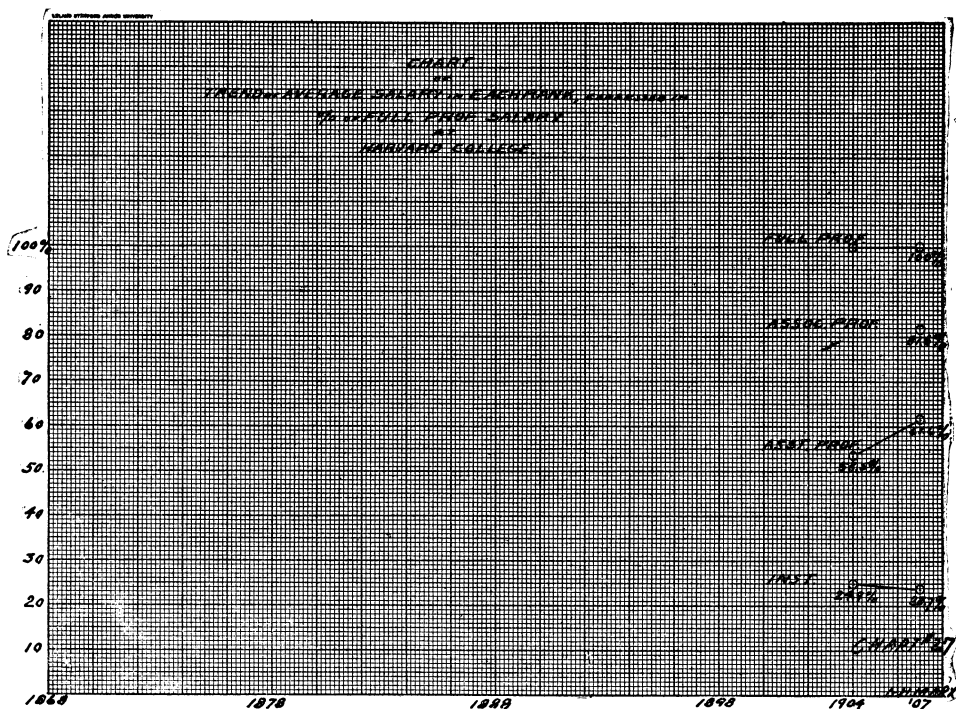
And this is no small factor in the prob-

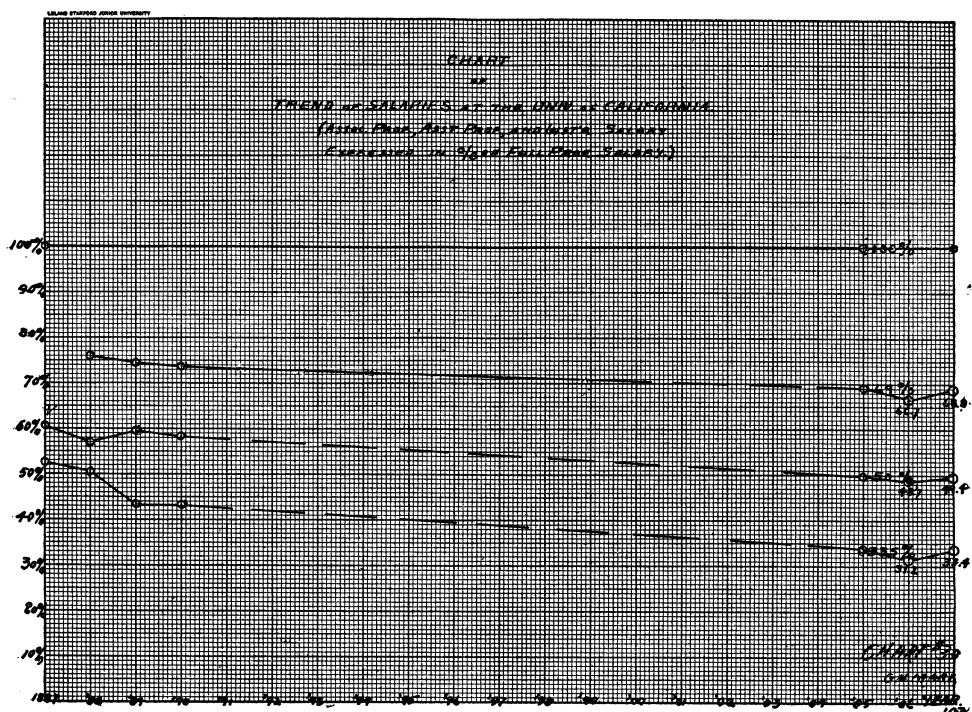
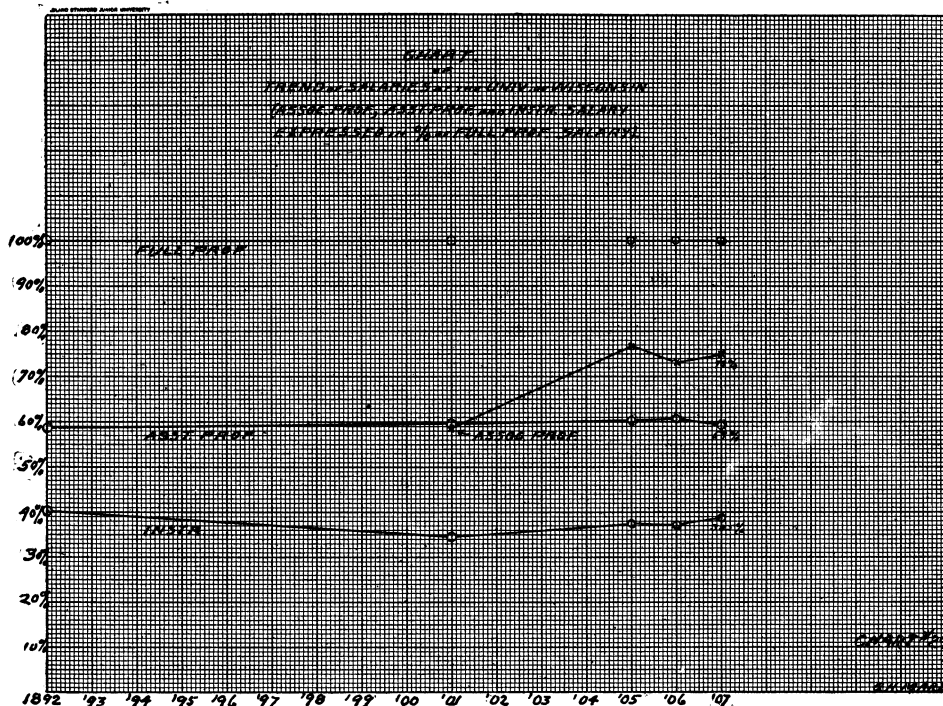


referred to, which seriously threatens efficiency.

Noting Charts 22–26, it is seen that the full professorship must be excepted from the downward trend of the past twenty years. In that rank—and that rank only—the average salary has increased. The effect of this, however, has been to widen the gap between the full professors and the rest of the staff. The remedy which has been proposed by some writers—notably President Pritchett—of bettering the general situation by offering a few

lem. It may be claimed that relative equity is of more importance than almost any other item touching compensation. Bearing in mind what has been said about age and preparation, do the conditions justify these great differences? It must be borne in mind that a university is not akin to a large factory or business organization in which the various classes of employees are separated by wide social gaps—each one moving in his own circle. On the contrary, by taste, training, ability and aspiration we belong to one compact

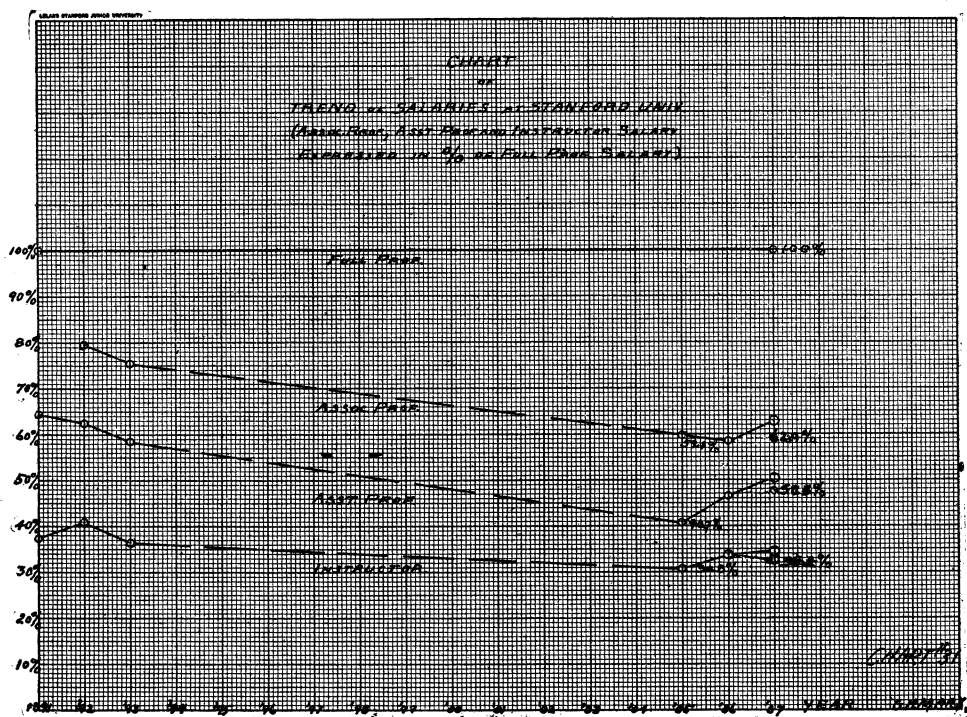






class—and the reciprocal demand between society and ourselves is far more a question of our age and corresponding family responsibilities than one of relative rank in our institution. As has been said, to the man on the street we are all “professor.” Careful observation for a number of years leads the writer gravely to doubt the differences in value of men to institutions which these averages indicate. It is his judgment that the sifting proc-

vance of his financial obligations to keep in touch with what the leaders in his field are doing by attending their meetings and joining the associations for mutual improvement and advancement of knowledge; to indulge himself in the prompt purchase of books, periodicals and in the satisfaction of other intellectual needs. The most heart-breaking sight in our university communities is to watch the hopeless struggle in which men of brilliancy



ess which has gone on from the lower grade schools, through the high schools, colleges and universities, results in the final selection of a few men of very nearly similar gifts and training for recruits to the profession; their further growth and development are largely a matter of opportunity rather than anything else. Here, as elsewhere, “to him that hath shall be given” rules supreme. Fortunate is he who is early able to get sufficiently in ad-

and promise, gripped by economic factors beyond their control, as in a vise which prevents their growth and development, suffer final narrowing and embittering defeat. It is a tremendous waste of expensively trained material.

The scale of salaries should justly be fixed in accord with the cost of living in the community in which an institution is located. But contrary to general belief—and on this subject the writer has in his

possession interesting and valuable data—the cost of maintaining the *same standard* of living is very slightly different throughout our whole country. The difference comes in mainly as a question of the allowable or *prevailing standard*. The wife of a professor in a prairie state “land grant” college, let us say, may quite properly come to her husband’s assistance by increasing the family exchequer through keeping chickens; the wife of a professor in New York City, from equally laudable motives, and without danger of incurring unfavorable criticism, may deplete the exchequer by giving elaborate dinners toward a similar end—but were either to adopt the method of the other she would at once be made to feel the impropriety of her course. It is even conceivable that each might think she would like to try the other plan for a change. The situation grows too complex for us to follow further. *De gustibus non disputandum*—and so we will leave this question of absolute standards.

Returning, however, to the matter of relative standards, it is fair to query, is it not possible to establish a relatively equitable standard as between the various ranks? We find Harvard paying her instructors 23.7 per cent. of what her full professors average. Cornell pays 29.1 per cent.; Stanford, 29.5 per cent.; California, 33.4 per cent. and Wisconsin, 38.5 per cent. There is a difference of opinion here of 50 per cent. as to the relative value of these men. Which is right?

Again, as to assistant professors: Stanford gives them 45.8 per cent. of the full professor’s compensation; California, 49.4 per cent.; Cornell, 54.7 per cent.; Wisconsin, 59 per cent. and Harvard, 61.6 per cent. Here is a difference of opinion of 33.3 per cent. Which is right?

As to associate professors we have: Stanford, 63.4 per cent.; California, 68.8

per cent.; Wisconsin, 75 per cent. and Harvard, 81.6 per cent.—a difference of 30 per cent. Again, which is right?

Surely there should be some closer agreement than this on so definite a question.

Similar differences of opinion are very evident elsewhere in fundamental questions of administration. The student of these problems who has struggled with the difficulties of obtaining dependable information hails with delight the valuable material already gathered and published by the Carnegie Foundation. The wholesome publicity and chance for comparison thus given will lead to vital educational reforms and greatly improved efficiency of the entire higher educational system in America.

The following table based upon statistics published by the Carnegie Foundation in Bulletin No. 2 shows the nature of some of the queries which may be raised.

What is a proper proportion of total annual income to be expended for salaries for instruction? Is it 37 per cent., as Missouri makes it at one end, or twice that, as Columbia, New York University, Pennsylvania and Princeton seem to agree?

Recalling charts 13–17; should there be one full professor to forty students, as in Harvard College, or one to twice that number of students, as at California?

Looking at our table again. Considering the entire staff, is Johns Hopkins right with one member of staff for 3.7 students, or are Chicago, Nebraska, Ohio, Syracuse, etc., correct with four or five times as great a ratio as this? A difference of opinion of 500 per cent. is considerable.

Or again, can efficient instruction be provided at an entire expenditure per student year of \$97 or \$98, as Syracuse and New York Universities have it, or should one expend \$456 or \$479, as do Harvard

TABLE IV

	Annual Income	Annual Sal. App. for Inst.	Ratio Sal. Inc.	Total Students	Total Inst. Staff	Ratio Stud. Inst.	Income per Stud.	Sal. Exp. per Stud.	Salary per Mem- ber Inst. Staff
Columbia	\$1,675,000	\$1,145,000	0.683	4,087	559	7.3	\$409	\$280	\$2,050
Harvard	1,827,789	841,970	0.462	4,012	573	7	456	210	1,470
Chicago	1,304,000	699,000	0.535	5,070	291	17.4	257	138	2,400
Michigan	1,078,000	536,000	0.498	4,282	285	15	252	125	1,880
Yale	1,088,921	524,577	0.483	3,306	365	9	529	159	1,440
Cornell	1,082,513	510,931	0.472	3,635	507	7.1	298	140	1,007
Illinois	1,200,000	491,675	0.410	3,605	414	8.7	333	136	1,183
Wisconsin	998,634	489,810	0.491	3,116	297	10.4	321	157	1,650
Pennsylvania	589,226	433,311	0.735	3,700	375	9.8	158	117	1,186
California	844,000	408,000	0.484	2,987	350	8.5	282	137	1,180
Stanford <sup>13</sup>	850,000	365,000	0.428	1,668	146	10.7	510	219	2,500
Toronto	610,000	324,000	0.532	3,498	368	9.5	179	93	881
Princeton	442,231	308,650	0.699	1,301	158	8.2	340	237	1,950
Mass. Institute	505,000	301,000	0.595	1,415	211	6.7	359	213	1,427
Minnesota	515,000	263,000	0.510	3,889	303	12.8	133	68	867
Ohio State	475,000	244,000	0.513	2,014	127	15.8	236	121	1,923
Nebraska	425,000	240,000	0.565	2,886	173	16.6	147	83	1,387
Missouri	655,000	239,110	0.372	2,070	144	14.3	317	115	1,660
McGill	425,000	225,000	0.518	1,163	191	6	365	194	1,176
N. Y. Univ.	303,500	220,000	0.725	3,110	211	14.7	98	71	1,043
Northwestern	491,132	218,151	0.445	2,485	261	9.5	198	88	835
Johns Hopkins	311,870	211,013	0.675	651	172	3.7	479	325	1,226
Syracuse	279,000	180,000	0.645	2,875	199	15.3	97	63	904
Temple C.	72,895	54,272	0.745	2,343	198	11.8	31	23	274

and Johns Hopkins?<sup>14</sup> Again there is a difference of opinion of 500 per cent.

Or, looking at the expenditure per student per year for instructional salaries; which are right, Syracuse and Minnesota at \$63 and \$68 or Columbia and Johns Hopkins at \$280 and \$325, respectively?<sup>15</sup> Again 500 per cent. difference.

In fact, the only uniformity appears to be in the difference of 500 per cent. Surely, our institutions can not vary as

<sup>13</sup> Data for Stanford appear to need modification. \$365,000 includes appropriation for administration, library and instructional staffs, 1907-8. Annual register gives 1,751 students and 218 staff, 1907-8. Excluding assistants, average salary \$2,367; including assistants (as above), about \$1,500.

<sup>14</sup> The figure of \$510 for Stanford includes extraordinary rebuilding expenses as well as sinking fund.

<sup>15</sup> In the *Transactions of the Commonwealth Club of California*, October, 1907, Assistant Treasurer Crothers, of Stanford, gives the instructional salary expenditure per student, 1907-8, as \$176.51.

much as these figures seem to indicate—or do they?

Coming to the last column of our table, obtained by dividing the instructional salary expenditure reported, by the reported number of members of the staff, is an average salary of \$274 per year, as given by Temple College (by the way, what is Temple College?) about right? Are Northwestern, Minnesota, Toronto, Syracuse, Cornell right at \$835, \$867, \$881, \$904 or \$1,007, respectively? Or are Columbia and Chicago, at \$2,050 and \$2,400, more near a proper standard?

It is such inquiries as these which are inevitably raised by the interesting and valuable data given in the reports of the Carnegie Foundation. And along this line of interesting and valuable data should be included the following table from the annual report of the treasurer of Yale University.

We are just at the beginning of making a real study of the economics of our higher

TABLE V

*Expenditure and Receipts per Student in Various Departments of Yale University, for the Year 1907-8<sup>18</sup>*

Department	No. of Students	Exp. per Stud.	Rec. per Stud.	Ratio Rec. Exp.
Graduate	357	\$159.45	\$ 40.17	25.2 per cent.
Academic	1315	339.56	152.27	44.8 per cent.
Shof. Scien.	948	279.66	160.25	57.3 per cent.
Theology	80	641.03		
Law	339	177.14	122.86	69.3 per cent.
Medicine	137	396.90	130.22	32.9 per cent.
Art	39	315.02	69.25	21.9 per cent.
Music	83	268.99	140.12	52.1 per cent.
Forestry	61	469.39	119.17	25.3 per cent.
All Departments	3359	296.85	113.25	44.9 per cent.

educational system. As a matter of mutual aid, as well as good faith, all chartered institutions should publish a complete annual financial statement.

And now, to sum up this survey, which has necessarily but touched upon main issues.

What are the conclusions to be drawn?

Considering the vast and growing army of students and the marvelous broadening of the field of study which is offered, the impossibility of the ideal of a university "where any person can find instruction in any study," unless it can command unlimited endowments, becomes sadly apparent. For, if it depends at all upon tuition fees and attempts to raise these to the actual cost of the yearly instruction, it will destroy the first part of its democratic ideal—some worthy persons will inevitably be excluded by the expense.

In the writer's judgment it can best fight off the evil day of financial or educational insolvency by frankly limiting its field. The term insolvency is used advisedly—for any institution which can only run by cashing in the loyalty of its employees through lamentably underpaying them, is no less than financially insolvent. And any institution which pre-

tends to and advertises educational resources which it does not possess is educationally bankrupt.

The trend is strong in the direction of limitation of field. Throughout the land we see a clearer and cleaner conception of the difference in nature between the college and university. For pedagogic, disciplinary and economic reasons this distinction is growing more and more marked and in obedience to them institutions are shaping their activities. The greatest educational reform going on in America to-day is involved in viewing our educational system, from the primary schools up, as a whole organism, each division having its distinct part to play, in regard both to its direct relation to the world at large and to its relation to the other parts. To arrive at the evident demand of the world at large with reference to higher education we may consider these facts: in 1905-6 with a population of 83,935,399 in the United States there were 279,270 students receiving higher instruction; the total number of degrees granted was 20,655, which included 1,386 masters of arts and 327 doctors of philosophy. Standing out most impressively we have the fact that a very small number of institutions of genuine graduate rank would suffice to fill the present needs of the nation. And it is precisely this work which is most expen-

<sup>18</sup> Report of the Treasurer of Yale University for the year ending June 30, 1908.



sive and in pursuit of which we find our institutions engaged in an undignified rivalry with vast expenditures caused by unnecessary duplications of staffs and plants. This is a waste to be stopped. We are dissipating our means and energies and in this the professors are their own worst enemies. Taking the liberty of quoting from a letter from President Eliot to the writer,<sup>17</sup> touching upon this point we find:

There can be no doubt that the increase in university salaries has not kept pace with increased cost of living during the last fifteen years. At Harvard—and I believe at other American universities—the failure to make the rise of salaries keep pace with the rise in the cost of living has been due in part to the natural desire to increase the teaching staff in proportion to the increasing number of students, and also to the keen demand for an increased provision of costly apparatus for teaching, particularly in the sciences. At Harvard I have seen with great regret a large increase in the expenditures for all sorts of objects which are not for direct teaching, though in themselves useful and desirable. The scale of living for colleges as well as for families has distinctly increased of late years, and the adoption of this new scale has interfered with the adequate raising of teachers' salaries.

Although President Eliot here lays stress on costly scientific apparatus, it must be borne in mind that in a recent report he took his faculty to task for extravagant book lists for the library—delicately calling attention to the fact that the need for many of the books called for could not be so very urgent, since it took a considerable portion of the time of the library staff to eliminate from these order lists the names of volumes already in the library. And it would not be out of place to recall here certain figures from the tables previously quoted from the reports of the treasurer of Yale University showing that in the order of cost of instruc-

tion the departments stand—theology, forestry, medicine, academic, art and then Sheffield Scientific; the cost per student year in the latter being \$17.19 less than the average of all departments. We may sum up, that we are all equally offenders in extravagant and ostentatious expenditures.

Coming back to the lesson to be taught from the statistics of degrees granted in 1905-6, coupled with the waste involved in unnecessary duplication, we can foresee that the next great step in educational reform will be along the line of limitation of field, particularly in the differentiation of the college from the university.

The great demand of the nation to-day is for collegiate training—a great deal better teaching of fundamentals with a view toward developing character and capacity. And ninety-nine one-hundredths of our present institutions could well limit themselves to this field with vast improvement in our educational efficiency. One important reform which this step would bring with it would be a new recognition of the almost forgotten fact that the prime function of the teacher is to teach—thus leading to adequate recognition and reward of teaching ability and devotion to the students' good—rather than discrediting this type of loyal service as is now the case.

There is already a strong trend toward a limitation of function by the institutions to those courses in which they can afford to give thorough instruction, supplementing each other rather than unnecessarily overlapping. A few institutions of ample endowment may be able to carry on for some years longer the combined function of university and college, but in these we shall find a sharper and sharper division-line drawn between the college and university work, with a marked difference in the handling of the students,

<sup>17</sup> In comment on advance sheets of some of the charts of this paper.

both pedagogic and disciplinary. Still fewer, with the men, means and reputation, say half a dozen in our whole country at first, will bravely lop off all collegiate work as soon as it is adequately provided for elsewhere and stand forth as full-fledged *universities*—places for the purposes of true advanced education, for real (not sham) investigation, and for the training of leaders in thought, science and action. Our nation does not yet seem to make a strong demand for many of these, judging by recent experience. What will probably take place, along with more efficient instruction, will be to make the break between collegiate and university work at the end of the present sophomore year as the Germans practically do. There are sound reasons for doing this both from educational and from administrative standpoints, and to these may be added the strong economic argument that it will place our young men and women—quite as well trained as our present college graduates—in the world of outside activities two years earlier in their lives.

As to salaries, with these reforms carried out, there can be no doubt of a continuation of the present trend toward improvement with a hope of an ultimate scale permitting a standard of living within the line of suitable dignity and comfort. The writer would again draw attention to the fact, overlooked too long, that the instructorship is the real key to the situation of the improvement in higher instructional efficiency, and that any fundamental improvement in conditions must be begun in the treatment of this rank. In disclosing the real state of affairs and in guiding the institutions toward a closer cooperation, and unification into an efficient whole, the reports of President Pritchett, of the Carnegie Foundation, have already proved to be of extreme value. Further reports along the lines

already indicated will undoubtedly but add to the indebtedness of the educational world to this foundation. With its trained staff and financial support it can carry out investigations which, even with the greatest industry and devotion, would be impossible of achievement through individual effort.

As a final paragraph, the writer would call the attention of his fellow teachers to the inspiring vision of this vast army of young men and women coming forward for training for the duties of life. Well may we conceive a new respect for the importance and significance of our calling, and in all sincerity and humility dedicate ourselves afresh to a life of unselfish service in the cause of humanity; for to our hands is entrusted no less a power than that of effectively molding the controlling ideals of our nation's immediate future. Bacon says:

We advise all men to think of the true ends of knowledge, and that they endeavor not after it for curiosity, contention or the sake of despising others, nor yet for reputation or power or any such inferior considerations, but solely for the occasions and uses of life.

The great heart of America is sound; her ills of haste, diffusion and superficiality are curable. Humanly speaking, the key to the solution of all her problems lies in the substitution of trained, clear thought-processes for the still too prevalent slovenly-mindedness.

GUIDO H. MARX

STANFORD UNIVERSITY

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#### SCIENTIFIC NOTES AND NEWS

A COMPLIMENTARY dinner was given on April 17 at Hotel Somerset, Boston, in honor of the seventieth birthday of Professor F. W. Putnam, since 1886 professor of American archeology and anthropology at Harvard University and for twenty-five years permanent secretary and later president of the American Association for the Advancement of Science.